



SHELL CHEMICAL CORPORATION

POST OFFICE BOX 211
TORRANCE, CALIFORNIA

August 7, 1957

Shell Oil Company
Area Land Right of Way Department
1008 West Sixth Street
Los Angeles 54, California

Attention Mr. C. K. Albright

Subject: Permits for Two Underground Pipelines Crossing
Vermont Avenue

Gentlemen:

We propose to construct two (2) interplant pipelines that will cross Vermont Avenue underground approximately 869.33' north of James Street. The pipelines will transfer liquid crude butadiene at 100 psig in a 2" and propylene vapor at 320 psig in a 3" line.

We understand that you are in the process of obtaining a blanket franchise covering Vermont Avenue between our Butadiene and Styrene Plants. Since you have probably developed background details concerning this transaction, we would appreciate your obtaining the required permits for the above pipeline installation.

The urgency and resulting savings to Shell Chemical Corporation by the installation of these pipelines are explained in the attached copy of AFE T-185 which has been assigned W.O. 61-379. We believe that construction could start on both pipelines in approximately sixty days.

Any further information required may be obtained from our Mr. W. H. Probst of the Torrance engineering department. He may be reached at FA. 1-2340, Ext. 414.

Yours very truly,

SHELL CHEMICAL CORPORATION

M. Voogd,
Plant Manager

Attach.

TORRANCE
SF-0012302

MEMORANDUM OF JUSTIFICATION
AFE NO. T-185, JULY 1, 1957
PIPELINES FOR RECOVERY OF
CRUDE PROPYLENE FRACTION
FROM BUTADIENE PLANT

SUMMARY

It is proposed to install 2,200 feet of 3-inch pipeline, 2,600 feet of 2-inch pipeline, and auxiliaries necessary to recover propylene and lesser amounts of other hydrocarbons from the crude propylene produced as a by-product in the Butadiene Plant. A saving of \$12,768/month will be realized, which results primarily from upgrading propylene from 2.05¢/gal (fuel value) to 7.5¢/gal (value to Shell Chemical, Dominguez).

The proposed 3-inch pipeline will enable transferring the crude propylene stream to the ethylene unit of the Styrene Plant for fractionation. At present, the crude propylene stream contains noncondensibles (principally CO_2) which cannot be removed with existing facilities and makes the stream unsuitable as propylene feed to Shell Chemical, Dominguez. Therefore, the stream is utilized as furnace fuel. The proposed fractionation of the stream in the ethylene unit will enable recovery of 815,670 lb/month of propylene which will be acceptable to Dominguez. In addition, C_4 's amounting to 83,892 lb/month will be recovered for return to the Butadiene Plant. The computed value of the increased recovery in by-product stream rates from the ethylene unit, after deduction of the present fuel value to the Butadiene Plant and additional utilities is \$12,247/month.

The proposed 2-inch pipeline will be used for returning to the Butadiene Plant the C_4 's recovered from the crude propylene stream. In addition, the C_4 's now produced in the Styrene Plant and transferred to the Butadiene Plant by truck will also be transferred in the 2-inch pipeline. The current trucking fees amount to \$6,225/year and would increase to \$7,700/year after the above recovery of the C_4 's from the crude propylene stream. It is proposed to install the 2-inch pipeline to save the trucking fees, and to install it concurrently and along the same routing as the 3-inch pipeline to minimize the installation cost as compared with each installed separately.

The total saving of hydrocarbon values and trucking fees over present conditions will be \$12,768/month. The total cost of the pipelines and accessories will be \$36,600. The pay-out time is 2.9 months. The installation will be completed by Shell labor within 20 weeks following approval.

PRESENT EQUIPMENT

Propylene is produced as a by-product in the catalytic dehydrogenation of butylene at the Butadiene Plant. An impure fraction of propylene is recovered overhead from the secondary depropanizer (C-304), which is a 6-plate rectifier column placed in series with the 30-tray depropanizer (C-303). Since propane and propylene cannot be separated in the Butadiene Plant from the noncondensibles (H_2 , CH_4 , and CO_2) in the overhead product from the secondary depropanizer (C-304), this overhead stream is unacceptable as propylene feed for the Dominguez Plant, and is presently burned as fuel. By transferring the rectifier column overhead to the de-ethanizer in the ethylene unit of the Styrene Plant, separation of the propane-propylene from the noncondensibles, especially CO_2 , can be effected.

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At present, in the ethylene unit, the bottoms from the ethylene column (C-2005), essentially ethane, propylene, propane, and C_4+ , are fed to the de-ethanizer (C-2006) for the separation of ethane from propane-propylene. The ethane overhead is used as fuel or recycled to the cracking furnaces. The de-ethanizer bottoms are subsequently sent to the depropanizer (C-2007) where the propane-propylene fraction is recovered in the overhead and piped to Shell Oil, Dominguez. The bottoms are fed into the debutanizer (C-2003) where a crude C_4 fraction is recovered and accumulated in a crude butadiene storage tank (V-2032). The crude butadiene fraction is periodically trucked from the ethylene unit to the Butadiene Plant.

PROPOSED EQUIPMENT

It is proposed to install a 3-inch pipeline to transfer 1,487,102 lb/month overhead from the depropanizer (column C-304) in the Butadiene Plant to the de-ethanizer (column C-2006) in the ethylene unit of the Styrene Plant. The de-ethanizer and succeeding columns in the ethylene unit will be used to effect a separation of C_2 's and C_4 's in combination with the comparable stream in the ethylene unit. The proposed process flow scheme and calculated material balance are shown on drawing YT-3801-2 for plant capacity rates. The CO_2 content of the propane-propylene fraction will then be 0.01% and will be acceptable to Dominguez. Propylene recovery will be about 95% of the propylene fed from the Butadiene Plant.

The routing for the new pipeline is shown on plot plan YT-5997. It will be necessary to compress the gas from 150 psig to 350 psig for fractionation in the ethylene unit. This will be done with one high stage cylinder of the Ingersoll Rand XVG-6 compressor (K-303D), existing in the Butadiene Plant. The existing interconnecting piping and knockout vessel (V-312) will be utilized as shown in drawing VT-6040.

It is also proposed to install a 2-inch pipeline, essentially paralleling the proposed 3-inch pipeline, to transfer about 370,000 lb/month of C_4 fraction from storage vessel V-2032 in the ethylene unit to feed drum V-156 in the Butadiene Plant.

The proposed new facilities are shown on drawings VT-6040 and VT-6041 and are as follows:

1. Approximately 2,200 feet of 3-inch interplant transfer pipe from compressor K-303D discharge to column C-2006.
2. Approximately 2,600 feet of 2-inch pipeline from V-2032 in the Styrene Plant to V-156 in the Butadiene Plant.
3. One 10 gpm, motor-driven centrifugal pump operating at 65 psi.
4. Instrumentation including: one flow recorder-controller, one pressure controller, one flow recorder, one flow indicator, two temperature indicators, one pressure recorder, and one pressure alarm.
5. Miscellaneous interconnecting piping, valves, and fittings.

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ALTERNATIVES

Recovery of the propylene by installation of new facilities to scrub out the CO_2 was considered but is not an attractive alternative as long as the columns in the ethylene unit have sufficient capacity to handle the stream. Two of the three columns involved in the ethylene unit have a demonstrated capacity for the additional flow at the 13.5 MM lb/month styrene production capacity. The third column (de-ethanizer) can adequately handle the stream under present conditions, but calculations of its performance at maximum styrene production level are uncertain due to the lack of data on the proprietary "Kaskade" trays used in the column. Relatively minor modifications of the column and accessories were considered, but were decided not to be justified until the loss of propylene recovery at high production levels is determined by plant experience.

Aside from equipment capacity considerations, only one possible problem is foreseen in the proposed propylene recovery operation. This problem is that introduction of CO_2 into the by-product ethane stream will possibly prohibit recycling the ethane to the pyrolysis furnaces for additional ethylene production. Substantial quantities of CO_2 would freeze out and plug the demethanizer column and its auxiliaries. However, ethane recycle is normally not practiced and is economically unjustified except for a short time during winter months when propane is in short supply. Although it may sometimes be desirable to recycle ethane concurrent with recovering propylene, further consideration of the possibility is not sufficiently urgent to delay the installations proposed herein.

JUSTIFICATION

The proposed installation will recover 815,670 lb/month of propylene which will be acceptable and useful to the Dominguez Plant. The credit to the Torrance Plant, which is presently 2.05¢/gal based on its use as fuel, will be increased to 7.5¢/gal. Some additional revenue also will be obtained by recovery of C_4 and propane components. The total of hydrocarbon values saved after deduction of utilities required for transportation and fractionation of the stream is \$12,247/month. The 2-inch crude butadiene line will eliminate current trucking fees which amount to \$6,225/year, and which would increase to \$7,700/year after the proposed recovery of the Butadiene Plant propylene stream is effected. The total savings over present conditions will be \$12,768/month.

The total cost of the pipelines and accessories will be \$36,600, and will be paid out in 2.9 months.

CONSTRUCTION SCHEDULE

The installation will be completed by Shell labor within 20 weeks following approval.

NEF:jc
6/26/57

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SP-0017310